কম্পিউটার সায়েন্স এন্ড ইঞ্জিনিয়ারিং বিভাগ
Department of Computer Science and Engineering
Comilla University
Comilla, Bangladesh
http://www.cou.ac.bd

Syllabus for B.Sc. (Hons.) courses in Computer Science and Engineering for the students admitted in the session: 2010-2011, 2011-2012 and onward sessions until any change is applied

Total Credits = (19.5+19.25) 38.75 + (18.25+21.5) 39.75 + (19.25+18.75) 38 + (22+21.5) 43. 5 = 160

First Year First Semester

Course ID	Course Title	Year	Semester	Credits
CSE-110	Introduction to Computer System	1	1	2
CSE-111	Structured Programming Language	1	1	3
CSE-112	Structured Programming Language LAB	1	1	1.5
MATH-113	Differential and Integral Calculus	1	1	3
CSE-114	Electrical Circuits and Devices	1	1	3
CSE-115	Electrical Circuits and Devices LAB	1	1	1.5
ENG-116	Communicative English	1	1	2
ACCT-117	Financial and Managerial Accounting	1	1	3
	Viva-voce	1	1	0.5
			Total =	19.5

First Year Second Semester

Course ID	Course Title	Year	Semester	Credits
CSE-121	Data Structure	1	2	3
CSE-122	Data Structure LAB	1	2	1.5
CSE-123	Discrete Mathematics	1	2	3
PHY-124	Physics	1	2	3
PHY-125	Physics LAB	1	2	0.75
CSE-126	Analog Electronics	1	2	3
CSE-127	Analog Electronics LAB	1	2	1.5
MATH-128	Differential Equations and Vector Analysis	1	2	3
	Viva-voce	1	2	0.5
			Total =	19.25

Second Year First Semester

Course ID	Course Title	Year	Semester	Credits
CSE-211	Object-Oriented Programming Language	1	1	3
CSE-212	Object-Oriented Programming Language LAB	1	1	1.5
CSE-213	Digital Logic Design	2	1	3
CSE-214	Digital Logic Design LAB	2	1	1.5
MATH-215	Algebra, Trigonometry and Matrices	2	1	3
CSE-216	Numerical Methods	2	1	3
CSE-217	Numerical Methods LAB	2	1	0.75
MGT-218	Industrial Management	2	1	2
	Viva-voce	2	1	0.5
			Total =	18.25

Second Year Second Semester

Course ID	Course Title	Year	Semester	Credits
CSE-221	Algorithm Analysis and Design	2	2	3
CSE-222	Algorithm Analysis and Design LAB	2	2	1.5
ECO-223	Economics	2	2	2
BDS-224	Bangladesh Studies	2	2	2
MATH-225	Complex Variable and Geometry	2	2	3
CSE-226	Computer Architecture and Organization	2	2	3
STAT-227	Statistics and Probability	2	2	3
CSE-228	Java Technologies	2	2	2
CSE-229	Java Technologies LAB	2	2	1.5
	Viva-voce	2	2	0.5
			Total =	21.5

Third Year First Semester

Course ID	**Course Title**	**Year**	**Semester**	**Credits**
CSE-311	Theory of Computation	3	1	2
CSE-312	Database Management System	3	1	3
CSE-313	Database Management System LAB	3	1	1.5
CSE-314	System Analysis and Design	3	1	3
CSE-315	Project Work (based on CSE-312 and CSE-314)	3	1	0.75
CSE-316	Data and Telecommunication	3	1	3
CSE-317	Data and Telecommunication LAB	3	1	1.5
CSE-318	Microprocessor and Assembly Language	3	1	3
CSE-319	Assembly Language LAB	3	1	1
	Viva-voce	3	1	0.5
			Total =	19.25

Third Year Second Semester

Course ID	**Course Title**	**Year**	**Semester**	**Credits**
CSE-321	Computer Peripherals and Interfacing	3	2	2
CSE-322	Interfacing and Microcontroller LAB	3	2	1.5
CSE-323	Software Engineering	3	2	3
MGT-324	Ecommerce	3	2	2
CSE-325	Operating Systems and System Programming	3	2	3
CSE-326	Operating Systems and System Programming LAB	3	2	1.5
CSE-327	Project Work (based on CSE-323)	3	2	0.75
CSE-328	Computer Networks	3	2	3
CSE-329	Computer Networks LAB	3	2	1.5
	Viva-voce	3	2	0.5
			Total =	18.75

Fourth Year First Semester

Course ID	**Course Title**	**Year**	**Semester**	**Credits**
CSE-411	Artificial Intelligence and Expert System	4	1	3
CSE-412	Artificial Intelligence and Expert System LAB	4	1	1.5
CSE-413	Compiler Design	4	1	3
CSE-414	Compiler Design LAB	4	1	1.5
CSE-415	Digital Signal Processing	4	1	3
CSE-416	Computer Graphics	4	1	3
CSE-417	Computer Graphics LAB	4	1	1.5
CSE-418	Web Engineering	4	1	2
CSE-419	Project or Thesis Work – I	4	1	3
	Viva-voce	4	1	0.5
			Total =	22

Fourth Year Second Semester

Course ID	**Course Title**	**Year**	**Semester**	**Credits**
CSE-421	Digital Image Processing	4	2	3
CSE-422	Pattern Recognition and Neural Networks	4	2	3
CSE-423	Pattern Recognition and Neural Networks LAB	4	2	1.5
CSE-424	VLSI Design	4	2	3
CSE-425	Parallel and Distributed System	4	2	3
CSE-426	Cryptography and Network Security	4	2	3
CSE-427	Cryptography and Network Security LAB	4	2	1.5
CSE-428	Project or Thesis Work – II	4	2	3
	Viva-voce	4	2	0.5
			Total =	21.5

Detailed Syllabus

First Year First Semester

CSE-110 Introduction to Computer System
Credits: 2, Hours/Week: 2

Introduction: History, Basic organization of computer, Types of computers: main frame, mini and micro computers; Different types of micro computers, I/O devices; The parts of a computer system, hardware, software. Critical components of computer system, processor, memory, input and output devices, storage. Categories of software. Categories of today's computer. Bit, byte and words; Number systems: binary, hexadecimal and octal numbers; Converting from one number system to another number, converting to decimal from another base, converting from decimal to another base, converting from a base other than 10 to a base other than 10, shortcut method for binary to octal conversion, shortcut method for octal to binary conversion, shortcut method for binary to hexadecimal conversion, shortcut method for hexadecimal to binary conversion. Fractional numbers. Different types of memory, How data is stored on a disk, how data is organized on a magnetic disk, tracks and sectors,clusters.How the operating system finds data on a disk, master boot record, FAT, root folder, data area, Optical storage devices, CD-ROM, pits and lands, DVD-ROM; BIOS, Types of softwares, System softwares; Operating system; Editors; Assemblers; Compilers; Interpreters; System utilities, Application packages, Multimedia; Robotics; Computers & IT, Computer virus.

Peripherals Devices: Printer; Keyboard; Mouse; Plotter; Scanner; Disk Storage; Controller cards; Buses.

Computer Networks: Computer networks, network card and accessories; Brief idea on network operating systems and popular NOS like Windows NT, UNIX, NOVEL, Data Communications and computer networks, basic elements of a communication system, data transmission modes, simplex, half duplex, full duplex. Data transmission speed, narrowband, voice band, broadband. Data transmission media, twisted-pair wire, coaxial cable, microwave system, communication satellite, optical fibers. Digital and analog transmission, modulation technique, AM, FM, PM. Data transmission services, dial-up line, leased line, ISDN, VAN. TCP/IP, SMTP, FTP, HTTP, DNS, SNMP, TELNET. Data and Information, Internet, internet, intranet, extranet. How networks are structured, LAN, CAN, MAN, WAN. Server-Based Networks, file server network, client/server network. Network topologies, bus, star, ring, mesh, and hybrid.

Application Packages: Different application packages like Word-processing, Spreadsheet analysis and Data base handling;

Programming Concept: Problem analysis, Algorithm build-up, Flowcharts and pseudo-coding.

Boolean algebra and logic circuit: logic addition, logic multiplication, complementation, operator precedence. The principle of duality, Theorem of boolean algebra, idempotent law, absorption law, involution law, De Morgan's law. Boolean functions. Logic gates, AND gate, OR gate, NOT gate, NAND gate, NOR gate, Logic circuits, The universal NAND gate, The universal NOR gate, Exclusive-OR, Equivalence functions, Design of Half-adder, Design of Full-adder.

Computer arithmetic: why binary, binary arithmetic, addition, subtraction, additive method of subtraction, 1's compliment, 2's compliment, subtraction using 1's and 2's compliment.

Recommended Books:

1. **Peter Norton,** Introduction to computers, 6th edition, 2006.
2. **P.K. Sinha**, Computer fundamentals, BPA pub. 2004.
3. **Rajaraman, V,** Fundamentals of Computers.
4. **Jain, Satish,** Introduction to Computer Science Vol. I & II.
5. **Balasubramanian**, Elements of Computer Science Vol. I.
6. **Wardfor,** Computer Science.
7. **P. Norton,** Inside the PC.
8. **Subramanian,** Introduction to computers.

CSE-111 Structured Programming Language
Credits: 3, Hours/Week: 3

Problem solving techniques: Problem Analysis, Algorithm, Flowchart, Debugging, Coding and Documentation.

Structured programming language: Overview of C, data types, variables, constants, operators, expressions, control structures; Functions and program structure: parameter passing conventions, scope rules and storage classes, recursion; Header files; Preprocessor; Pointers and arrays; Strings; Multidimensional array; User defined data types: structures, unions, enumerations; Input and Output: standard input and output, formatted input and output, file access; Variable length argument list; Command line parameters; Error Handling; Graphics; Linking; Library functions.

Recommended Books:

1.	Kernighan and Ritchie	:	The C Programming Language
2.	Gotfreid	:	Programming with C, Schaum's Outline Series, TMH
3.	M. Keller	:	A first Course on Computer Programming using Pascal, McGraw-hill, 1987
4.	D.E. Knuth	:	The Art of Computer Programming
5.	H. Schieldt	:	The complete reference, Turbo C/C++
6.	E. Balagurusamy	:	Programming with ANSI C
7.	H. Schieldt	:	Teach yourself C
8.	Cochan S G	:	Programming in C
9.	Tondo & Gimped	:	C Answer book, 2nd Ed., PHE.
10.	Balagurusamy E	:	Programming in ANSI C

CSE-112 Structured Programming Language LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-111

MATH-113 Differential and Integral Calculus
Credits: 3, Hours/Week: 3

Differential Calculus: Limits, continuity and differentiability; Successive differentiation of various types of functions; Leibniz Theorem; Rolle Theorem; Mean value Theorem in finite and infinite forms; Lagrange form of remainders; Cauchy form of remainder; Expansion of functions; Evaluation of indeterminate forms by LHospital rule; Partial differentiation; Euler Theorem; Tangent and Normal, Subtangent and subnormal in cartesian and polar co-ordinates; Maximum and minimum values of functions of single variable; Points of inflexion; Curvature, radius of curvature, center of curvature; Asymptotes, curve tracing.

Integral Calculus: Definitions of integration; Integration by the method of substitutions; Integration by parts; Standard integrals; Integration by the method of successive reduction; Definite integrals and its properties and use in summing series; Walli formula, Improper integrals, Beta function and Gamma function; Area under a plane curve in cartesian and polar co-ordinates; Area of the region enclosed by two curves in cartesian and polar co-ordinates; Trapezoidal rule, Simpson rule. Arc lengths of curves in cartesian and polar co-ordinates, parametric and pedal equations; Intrinsic equation; Volume of solids of revolution; Volume of hollow solids of revolution by shell method. Area of surface of revolution; Jacobian, multiple integrals and their application.

Recommended Books:

1.	B.C. Das and B.N. Mukherjee	:	Differential calculus
2.	Mohammad, Bhattacharjee and Latif	:	A text book on differential calculus
3.	B.C. Das	:	Integral calculus
4.	Dr. Abdul Matin	:	Integral calculus
5.	Howard and Anton	:	Calculus a new horizon
6.	Ayres, F	:	Calculus
6.	Edwards	:	Differential calculus

CSE-114 Electrical Circuits and Devices
Credits: 3, Hours/Week: 3

Introduction to voltage, current, voltage source, conductors, insulators, resistances; Ohm’s law, KVL, KCL, voltage and current divider rules;

Network sources and Analysis: Voltage sources; Voltage sources in parallel; Open and short circuits; Current sources in series and parallel; Source conversion; Branch-current analysis; Mesh analysis; Nodal analysis; Y-Δ and Δ-Y conversion.

Network Theorems: Superposition theorem; Thevenin’s theorem; Norton’s theorem; Maximum power transfer theorem; Millman’s theorem; Substitution theorem; Reciprocity theorem.

Basic Passive Elements: Resistors, inductors and capacitors in series and parallel; transient response in capacitive networks; Charging and discharging phases; R-L transients; Storage cycle, Decay phase.

Fundamentals of AC and the Basic elements and Phasors: AC fundamentals; Generation of alternating voltage & currents; Sine wave; Frequency spectrum and phase relations; General format of sinusoidal voltage and currents; Phase & algebraic representations of sinusoids; Average & RMS (effective) values; Response of basic R,L,C elements to a sinusoidal voltage & currents; frequency response of basic elements; Impedance and phasor diagram; Average power & power factor; Complex numbers: Rectangular & polar form: Active & reactive power; Resonance, Series & parallel resonance circuit; Qualify factor, Selectivity; Fourier Series.

Transformer: Construction and features of transformer; Transformer on no- load and on load; emf-equation; Phasor diagram; Equivalent circuits; Losses and efficiency.

Recommended Books:

1. **R. L. Boylestad**, Introductory Circuit Analysis, Prentice Hall, 2006.
2. **R. M. Kerchner, G. F. Corcoran**, Alternating Current Circuits, Wiley Eastern Limited, 1994.
3. **J. Nagarath and D. P. Kothari**, Electric Machines, Tata McGraw-Hill, 1999.
4. **F. Puschstein, T. C. Lloyd, A. G. Conrad**, Alternating Current Machines, Asia Publishing House, 1996.

CSE-115 Electrical Circuits and Devices LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-114

ENG-116 Communicative English
Credits: 2, Hours/Week: 2

Speaking**:** How to ask questions, make requests and give instructions; How to respond to queries, invitations and statements; How to introduce and thank, express gratitude, regret or appreciation; How to communicate in particular every day situations; How to express different concepts: ability, possibility, futurity, necessity, obligation, assumption, regularity, continuity, arrangement, comparison, etc.

Reading**:** For skimming; For comprehension; For interpretation.

Writing: Spelling, punctuation, indenting, brackets, abbreviation, numbers and fractions, capitalization, underlining, hyphenation, etc, Organization of writing- of sentences in paragraph, and of paragraphs, in essays and letters. Practical Writing**:** personal & official correspondence, job application, CV.

Vocabulary: Clues to the meaning of a word: Position in the clause, prefixes, suffixes, roots, revising and expanding vocabulary.

Grammar: Clause: structure, function, variation and expansion, The noun in the clause: number, determiners, The Pronoun in the clause: number, case, agreement and reference. The verb in the clause: form, tense, voice, mood, subject-verb agreement. The modifiers in the clause: adjective, adverb, infinitive, participles, The conjunctions and prepositions to suggest different relationships: time, space, cause, result, purpose, condition, exception, etc., Remedial grammar: Identifying and correcting errors and weaknesses.

Listening Comprehension/Movie show**:** Introducing audio visual materials and/or movies to develop listening skills.

Recommended Books:

1. **P.C. Das**, Applied English Grammar & Composition, 4ed, M. L. Dey & Co. (C Estd. 1868), 1997.
2. **Matthew M Monippally**, The Craft of Business Letter Writing, 1ed, Tata McGraw-Hill Publishing Company Limited, NEW DELHI, 1997.
3. **Yung-Yee Wu**, The Princeton Review GRE Verbal Workout, Random House, Inc.
4. **Angus Maciver**, The New First Aid in English, Revised edition, 1986.
5. **Mark Alan Stewart**, Arco Word Smart, Macmillan, USA, reprint 2002

ACC-117 Financial and Managerial Accounting
Credits: 3, Hours/Week: 3

Financial Accounting: Objectives and importance of accounting; Accounting as an information system; computerized system and applications in accounting; Recording system: double entry mechanism; Accounts and their classification; Accounting equation; Accounting cycle: journal, ledger, trial balance; Preparation of financial statements considering adjusting and closing entries; Accounting concepts (principles) and conventions. Financial statement analysis and interpretation: ratio analysis. Long-term investment decisions: capital budgeting, various techniques of evaluation of capital investments.

Management Accounting: Cost concepts and classification; Overhead cost: meaning and classification; Distribution of overhead cost; Overhead recovery method/rate; Job order costing: preparation of job cost sheet and quotation price; Inventory valuation: absorption costing and marginal/variable costing technique; Cost-Volume-Profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis.
Short-term investment decisions: relevant and differential cost analysis.

Recommended Books:

1. **J. J. Weygandt, D. E. Kieso**, Principles of accounting 8th ed. 2006.
2. **H. Chakrabarty**, Advanced accounting.

3. **R.E. Ross Claudia, B Gilbertson, Mark W. Lehman, O.D. Manson**, Fundamentals of Accounting of Course 7th Ed.
4. **Narayanaswamy**, Financial Accounting for Business Managers. 3rd Ed. PHI
5. **Kieso and Kimmel**, Basic Accounting.
6. **Md. Hafiz Uddin**, Basic Accounting.

Viva-voce
Credits: 0.5

At the end of semester final examinations, interview in front of the board of examiners based on the courses of the corresponding semester.

First Year Second Semester

CSE-121 Data Structure
Credits: 3, Hours/Week: 3

***Introduction*:** Basic Terminology, Elementary Data Organization, Data Structures, Algorithms, and Complexity of Algorithms

Arrays: Maximization, ordered lists, sparse matrices, representation of arrays.

Stacks, Queues and Recursion: Fundamentals of different types of stacks and queues: Circular, dequeues, etc; evaluation of expressions, multiple stacks and queues; Recursion: Direct and indirect recursion, depth of recursion; Simulation of Recursion: Removal of recursion; Towers of Hanoi.

Links Lists: singly linked lists, linked stacks and queues, the storage pool, polynomial addition, equivalence relations, sparse matrices, doubly linked lists and dynamic storage management, generalised lists, garbage collection and compaction.

Trees: Basic terminology, binary trees, binary tree representations, binary tree traversal; Extended binary trees: 2-trees, internal and external path lengths, Huffman codes/algorithms; threaded binary trees, binary tree representation of trees; Application of Trees: Set representation, decision trees, games trees: Counting binary trees.

Graphs: Introduction, definitions and terminology, graph representations, traversals, connected components and spanning trees, shortest path and transitive closure, activity networks, topological sort and critical paths, enumerating all paths.

Internal Sorting: Searching, bubble sort, shell sort, insertion sort, selection sort, quick sort, heap sort, 2-way merge sort, How fast can we sort? Sorting on several keys, practical considerations for internal sorting.

External Sorting: General idea; Sorting with Disks: K-way merging, buffer handling for parallel operation, run generation; sorting with Tapes: Balanced merge sorts, polyphase merge, sorting with fewer than 3 tapes.
Symbol Tables: static tree tables, dynamic tree tables; Hash Tables: Hashing functions, overflow handling, theoretical evaluation of overflow techniques.

Recommended Books:

1. E. Horowitz and S. Sahni : Fundamentals of Data Structures, Galgotia, 1985.
2. Reingold : Data Structures.
3. Robert L. Kruse : Data Structures and Program Design, 3rd Edition.
4. Niklaus Wirth : Algorithms-Data Structures-Programs, Prentice Hall of India, 1992.
5. Lipshultz : Data Structures, Schaum's Outline Series, 1987.
6. E. Horowitz and S. Sahni : Computer Algorithms, Galgotia, 1985.
7. Goodman and Hedetnie : Introduction to Design and Analysis of Algorithms, McGraw-Hill, 1985
8. Taunenbaum, Langsam : Data Structure Using C

CSE-122 Data Structure LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-121

CSE-123 Discrete Mathematics
Credits: 3, Hours/Week: 3

***Logic and Proofs*:** Proposition, propositional variables, compound propositions, propositional calculus, truth table, conditional statements, converse, contrapositive and inverse of a conditional statement, bi-conditional statements, precedence of logical operators, concept of tautology, contradiction and contingency; logical equivalences;

***Predicates and Quantifiers*:** propositional function and predicate calculus, quantification, universal and existential quantification, bound and free variables, logical equivalences involving quantifiers, negating quantified expressions, concept of nested quantifiers.

Rules of Inference**:** arguments and valid arguments, premises, rules of inference and their uses in building arguments, resolution.

Introduction to proofs**:** formal and informal proofs, concept of theorem, axioms, lemma, corollary and conjectures; direct and indirect proofs, proof by contraposition, vacuous and trivial proof, proof by contradiction, exhaustive proof and proof by cases, existence and uniqueness proof.
Set Theory**:** Definition of sets and operations on sets.

Functions**:** function definition; domain, co-domain and range of functions, images and pre-images, one-to-one and onto functions; increasing and decreasing function; one-to-one correspondence; identity and inverse functions; composition of functions; floor and ceiling functions;

Number theory**:** Integers and Division, primes and greatest common divisors, applications.

Mathematical Induction**:** Introduction to mathematical induction.

Counting**:** Basics of counting; pigeonhole principle, permutations and combinations.

Relations**:** Relations and their properties; n-ary relations and their applications, representing relations, closures of relations, equivalence relations.

Graphs and Trees**:** Graph and Graph Models, Graph terminology and special type of graphs, representing graphs, graph isomorphism, connectivity, shortest-path problem, graph coloring; Trees: Introduction, traversal and applications.

Recommended Books:

1. **Rosen, K.R**., Discrete Mathematics & Its Application, McGraw-Hill, 1999.
2. **Lipschutz S.** , Lipson M., Theory and Problems of Discrete Mathematics, Schaum's Outlines TATA McGraw-Hill, 2004.
3. **J. P. Tremblay and R. Manohar**, Discrete Mathemetical Structures with Applications to Computer Science, TATA McGraw-Hill, 1997.
4. **K. D. Josh**i, Fundamentals of Discrete Mathematics, New Age International Limited, 1996.
5. **C.L. Liu**, Elements of Discrete Mathematics, 2nd Ed. McGraw-Hill, 1985.
6. **Sharon Ross**, Discrete Mathematical Structure.

PHY-124 Physics
Credits: 3, Hours/Week: 3

Heat and Thermodynamics: Principle of temperature measurements: platinum resistance thermometer, thermo-electric thermometer, pyrometer; Kinetic theory of gases: Maxwell's distribution of molecular speeds, mean free path, equipartition of energy, Brownian motion, Van der Waal's equation of state, review of the First Law of thermodynamics and its application, reversible and irreversible processes, Second Law of thermodynamics, Carnot cycle; Efficiency of heat engines, Carnot's Theorem, entropy and disorder, thermodynamic functions, Maxwell relations, Clausius-Clapeyron Equation, Gibbs Phase Rule, Third Law of thermodynamics.

Waves and Oscillations: Differential equation of a simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, Lissajous' figures, spring-mass system, calculation of time period of torsional pendulum, damped oscillation, determination of damping co-efficient, forced oscillation, resonance, two-body oscillations, Reduced mass, differential equation of a progressive wave, power and intensity of wave motion, stationary wave, group velocity and phase velocity, architectural acoustics, reverberation and Sabine's formula.

Physical Optics: Theories of light; Interference of light, Young's double slit experiment; Displacements of fringes and its uses; Fresnel Bi-prism, interference at wedge shaped films, Newton's rings, interferometers; Diffraction of light: Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit & N-slits-diffraction grating; Polarization: production and analysis of polarized light, Brewster's law, Malus law, Polarization by double refraction, retardation plates, Nicol prism, optical activity, polarimeters, polaroid.

Electromagnetism:The Magnetic Field: Definition of B, Effect of magnetic force on current, Torque on a current Loop, Hall effect; Ampere's Law: B near a long wire, Magnetic lines of induction, Two parallel conductors, B for a solenoid, The Biot-Savart's Law.

Electromagnetism**:** Maxwell's Equation, Electromagnetic wave equation and propagation, Pointing vector, Faraday's laws of electromagnetic induction, Lenz's Law, Motional e.m.f, Eddy current. Self and Mutual Inductance.

Recommended Books:

1. **David Halliday, Robert Resnick**, Physics Part-II, Wiley Eastern Limited, 1992.
2. **D. K. Cheng**, Field and Wave Electromagnetics, Pearson Education, 2001.
3. **D. N. Vasudeva**, Fundamentals of Magnetism and Electricity, S. Chand and Company Limited, 1998.
4. **K. K. Tewari**, Electricity and Magnetism with Electronics, S. Chand and Company Limited, 1995.

PHY-125 Physics LAB
Credits: 0.75, Hours/Week: 3/2

Laboratory works based on PHY-124

CSE-126 Analog Electronics
Credits: 3, Hours/Week: 3

Energy Bands in Solids**:** The nature of the Atom, Atomic energy levels, Valence and conduction bands, Conductors, Semiconductors and Insulators.

Semiconductor Diode and Rectifiers**:** Semiconductors' characteristics and their types, P-N Junction Diodes and their V-I Characteristics; Zener Diode, Ideal Rectifier Concept, P-N Junction Diode as a Rectifier; Half-wave and Full-wave Rectifiers; Rectifier Filters and Ripple Factor, Voltage Regulator Using Zener Diode, Clipper, Clamper.
Transistor**:** PNP and NPN Junction Transistors; CB, CE and CC Configurations and their V_c-I_c Characteristics; Transistor Action; Different Types and Biasing; Bias Stabilisation; Operating Point; DC and AC Load Lines; Dynamic Transfer Curve, Current, Voltage and Power Gains. Transistor as a Circuit Element, Transistor Hybrid Parameters.

Transistor Amplifiers**:** Transistor DC Amplifiers; CE, CB and CC Amplifiers , their Equivalent Circuits and Computation of Current, Voltage and Power Gains; Class A, Class B and Class C Amplifiers, class AB pushpull Amplifier.

Feedback Amplifiers**:** Feedback Principles and Characteristics; Current and Voltage Feedback Amplifiers; Positive and negative feedback.

Oscillators**:** Oscillators and Conditions for Sustained Oscillations; RC Phase Shift, Collpit and Crystal Oscillators.

MOS devices**:** Introduction to JFET, MOSFET, PMOS, NMOS & CMOS: biasing & application in switching circuits.

Recommended Books:

1.	A. Mottershead	:	Electronic Devices and Circuits
2.	Milman and Helkias	:	Integrated Electronics
3.	B. L. Theraja	:	Basic Electronics
4.	B. Grob	:	Basic Electronics
5.	V. K. Mehta	:	Principles of Electronics
6.	Illiot	:	Microelectronics Fabrication Technology
7.	Boylestad and Nashelsky	:	Network Lines and Fields
8.	B. L. Theraja	:	Basic Electricity and Magnetism
9.	Boylestad and Nshelsky	:	Electronic Devices and Circuit Theory
10.	Gupta and Kumar	:	Hand Book of Electronics

CSE-127 Analog Electronics LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-126

MATH-128 Differential Equations and Vector Analysis
Credits: 3, Hours/Week: 3

Ordinary Differential Equation (ODE): Degree and order of ordinary differential equations; Formation of differential equations; Solution of first order differential equations by various methods; Solution of first order but higher degree ordinary differential equations; Solution of general linear equations of second and higher orders with constant coefficients; Solution of homogeneous linear equations and its applications; Solution of differential equations of higher order when dependent and independent variables are absent; Solution of differential equation by the method based on factorization of operators.

Partial Differential Equations (PDE): Four rules for solving simultaneous equations of the form; Lagrange method of solving PDE of order one; Integral surfaces passing through a given curve; Nonlinear PDE of order one (complete, particular, singular and general integrals): standard forms $f(p, q) = 0$, $z = px + qy + f(p, q)$, $f(p, q, z) = 0$, $f_1(x, p) = f_2(y, q)$; Charpit method; Second order PDE: its nomenclature and classifications to canonical (standard)- parabolic, elliptic, hyperbolic; Solution by separation of variables. Linear PDE with constant coefficients.

Vector Spaces: Definition and properties, subspaces, basis and dimension, change of basis; Linear Transformation (LT): definition and properties, linear operator matrix, geometry of LT, standard plane LT.

Vector Algebra: Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars; Scalar and vector product of two vectors and their geometrical interpretation; Triple products and multiple products; Linear dependence and independence of vectors.

Vector Calculus: Differentiation and integration of vectors together with elementary applications; Definition of line, surface and volume integrals; Gradient, divergence and curl of point functions, various formulae, Gauss theorem, Stoke theorem, Green theorem.

Recommended Books:

1. S L Ross : Introduction to Ordinary Diff. Equations
2. F Ayres : Differential Equations
3. B D Sharma : Differential Equations
4. M.D. Raisingha Mia : Ordinary and Partial Differential Equations

Viva-voce
Credits: 0.5

At the end of semester final examinations, interview in front of the board of examiners based on the courses of the corresponding semester.

Second Year First Semester

CSE-211 Object-Oriented Programming Language
Credits: 3, Hours/Week: 3

Introduction to object oriented programming (OOP); Advantages of OOP over structured programming; C++ as an object oriented language; Declaration and constants, expression and statements, data types, operator, Functions; Classes: Base, Derived virtual class; Encapsulation, objects, access specifiers, static and non-static members; Constructors, destructors and copy constructors; Array of objects, object pointers, and object references; Inheritance: single and multiple inheritance; Polymorphism: overloading, abstract classes, virtual functions and overriding; Exceptions; Object Oriented I/O; Template functions and classes; Streams, titles, C++ binary functions, exception handling, Multi-threaded Programming.

Recommended Books:

1. H. Schidt : Teach yourself C++
2. Schildt, H : Turbo C/C++: The Complete Reference
3. N. Barkakati : Object Oriented Programming with C++
4. Balagurusamy, E : Object Oriented Programming with C++
5. B. Stroustrap : The C++ programming Language, 2nd ed.
6. D. Ravichandran : Programming with C++

CSE-212 Object-Oriented Programming Language LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-211

CSE-213 Digital Logic Design
Credits: 3, Hours/Week: 3

Fundamentals of Digital Logic System: Number Systems and Codes, Logic Gates and Boolean Algebra, Logic Circuit Design, Minimization Techniques: Algebraic Simplification, Karnaugh Map Method, Quine-McCluskey method, Consensus method.

Switching Devices: Switching concepts of Diodes, Transistors and FETs.

Integrated Circuit Logic Families: DTL & TTL logic family, standard TTL series characteristics, other TTL series, TTL loading rules, TTL open-collector outputs, tristate TTL. The ECL family. Digital MOSFET circuits, characteristics, CMOS circuits, CMOS tristate logic, TTL driving CMOS, CMOS driving TTL.

Flip-Flops and related Devices: Transistor Latch, NAND gate latch, NOR gate latch, D latch. Clock signals and Clocked F.Fs: Clocked S-C, J-K and D Flip-Flops. F.F timing considerations, Master/Slave F.Fs. F.F T-F.F. applications, Frequency division and counting. Schmitt Trigger devices, Monostable and Astable Multivibrators.
SSI Logic Circuits: BCD to decimal decoders, BCD to 7 segment decoder/drivers. Encoders, Multiplexers and their applications. Demultiplexers. Trouble shooting case studies.

Introduction to sequential circuits: formal representation of sequential circuits, Moore and Mealy models, analysis and synthesis of synchronous and asynchronous sequential circuits. Counters and Registers: Asynchronous (Ripple) up and down counters, Synchronous up and down Counters. Counters with MOD number $<2^N$. Propagation delay in Ripple counters. Presettable counters. The 74193 counters. Counter applications. Shift registers. IC shift-registers, shift-register counters.

Analog to digital conversion, digital ramp, successive approximation, flash and tristate ADC. digital to analog conversion: circuits, specifications, applications, Sample and hold circuits. Analog multiplexers. Data acquisition, digital voltmeter.

Recommended Books:

1. R.J. Tocci : Digital Systems, 5th edition, PHI
2. D.V. Hall : Digital Circuits and Systems, McGraw-Hill, 1989
3. F.P. Prosser and D.E. Einkel : The Art of Digital Design, Prentice-Hall
4. V. K. Jain : Switching Theory and Digital Electronics
5. Moris Manno : Digital Logic and Computer Design
6. Malvino & Leach : Digital Principles and Applications
7. Jain R.P. : Modern Digital Electronics

CSE-214 Digital Logic Design LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-213

MATH-215 Algebra, Trigonometry and Matrices
Credits: 3, Hours/Week: 3

Elements of Set Theory**:** Introduction to sets. Set Algebra. Types of sets: Finite, infinite, countable and uncountable sets. Relations and Functions.

Matrices**:** Definition and Algebra of matrices; Special types of matrices. Determinant of a square matrix: Properties; Crammer's rule; Rank of a matrix; elementary transformation and normal form. The adjoint and inverse of a square matrix. Matrix inversion by partitioning; Solution of system of linear equations: Gauss-Jordan method.

Theory of equations**:** Relation between roots and coefficients. De Carte's rule of sign. Solution of cubic and biquardratic equations. Symmetric functions of the roots.

Trigonometry**:** Complex number. De-Moiver's Theorem and it applications. Functions of complex arguments. Gregory's series. Summation of trigonometric series. Hyperbolic functions.

Recommended Books:

1. F Ayres : Theory and problems of Matrices
2. McDuffe : Theory of Matrices
3. M L Khanna : Matrices
4. Shahidullah and Bhattacharjee : Higher Algebra and Trigonometry

5. Bernard and Child : Higher Algebra
6. Hall and Knight : Higher Trigonometry
7. Das and Mukherjee : Higher Trigonometry

CSE-216 Numerical Methods
Credits: 3, Hours/Week: 3

Approximations and Errors: Accuracy and Precision, Error Definitions, Round-Off Errors, Truncation Errors.

Roots of Equations: Graphical Methods, The Bisection Method, The False-Position Method, Simple One-Point Iteration, The Newton-Raphson Method, The Secant Method.

Systems of linear algebraic equations: Gauss Elimination, Solving Small Numbers of Equations, Naive Gauss Elimination, Pitfalls of Elimination Methods, Matrix Inversion and Gauss –Seidel, The Matrix Inverse, Error Analysis and System Condition.

Curve Fitting: Linear Regression, Polynomial Regression, Multiple Linear Regression, Newton's Divided-Difference Interpolating Polynomials, Lagrange Interpolating Polynomials, Coefficients of an Interpolating Polynomials, Curve Fitting with sinusoidal Functions.

Numerical Differentiation and Integration: The Trapezoidal Rule, Simpson's Rules, Integration with Unequal Segments, Romberg Integration, Gauss Quadrature, High-Accuracy Differentiation Formulas, Richardson Extrapolation, Derivatives of Unequally Spaced Data.

Numerical Solutions of Ordinary Differential Equations: Euler's Method, Modifications and Improvements of Euler's Methods, Runge-Kutta Methods, Adaptive Runge-Kutta Methods.

Recommended Books:

1. Chopra : Numerical Methods for Engineers.
2. S. S. Kuo : Computer Application of Numerical Methods
3. S. S. Sastry : Introductory methods of Numerical Analysis.
4. Rajaraman, V. : Computer Oriented Numerical Methods

5. Robert J. Schilling and Sandra L Harries : Applied Numerical Method for Engineers, Thomson Books, 2002
6. Kendall Atkison : Elementary Numerical Analysis, John Wiley & Sons, 1986
7. S. Balachandra & C.K. Shantha : Numerical Methods, 2000

CSE-217 Numerical Methods LAB
Credits: 0.75, Hours/Week: 3/2

Laboratory works based on CSE-216

MGT-218 Industrial Management
Credits: 2, Hours/Week: 2

Introduction, evolution, management function, organization and environment.

Organization: Theory and structure; Coordination; Span of control; Authority delegation; Groups; Committee and task force; Manpower planning.

Personnel Management: Scope; Importance; Need hierarchy; Motivation; Job redesign; Leadership; Participative management; Training; Performance appraisal; Wages and incentives; Informal groups; Organizational change and conflict.

Cost and Financial Management: Elements of costs of products depreciation; Break-even analysis; Investment analysis; Benefit cost analysis.

Management Accounting: Cost planning and control; Budget and budgetary control; Development planning process.

Marketing Management: Concepts; Strategy; Sales promotion; Patent laws.

Technology Management: Management of innovation and changes; Technology life cycle; Case studies.

Recommended Books:

1. Steven J. Skinner, John M. Ivancevich : Business for the 21st Century
2. Harold Koontz : Management

Viva-voce
Credits: 0.5

At the end of semester final examinations, interview in front of the board of examiners based on the courses of the corresponding semester.

Second Year Second Semester

CSE-221 Algorithm Analysis and Design
Credits: 3, Hours/Week: 3

Introduction to Algorithm and Mathematical Induction: Introductory concepts and definitions related to algorithms, notation for describing algorithms, introduction to mathematical induction, examples, counting regions in the plane, simple coloring problem, simple inequality, Euler's formula, Finding edge-disjoint paths in a graph, Arithmetic versus geometric means, loop invariant etc.

Analysis of Algorithms' Complexity and Design of Algorithms by Induction**:** The O notation, time and space complexity, recurrence relations: intelligent guesses, divide and conquer relations, recurrence relation with full history, design by induction: evaluation polynomials, maximal induced subgraph. finding one-to-one mappings, the Celebrity Problem, The skyline problem, computing balance factors in binary trees, finding the maximum consecutive subsequence, strengthening the induction hypothesis , dynamic programming: the Knapsack problem, etc.

Algorithms Involving Sequences and Sets**:** introduction, Binary search and variations, Interpolation search, sorting: Bucket sort, Radix sort, Insertion sort, Selection sort, Mergesort, Quicksort, Heapsort, order statistics, data compression, string matching, sequence comparisons, probabilistic algorithms, finding a majority, etc.

Graph and Geometric Algorithms**:** introduction, Eulerian graphs, graph traversals: Depth-First Search, Breadth-First Search, Topological Sorting, minimum-cost Spanning trees, ,network flows, Hamiltonian tours, decomposition of graphs, construction polynomials, convex hulls, closest pair, intersection of horizontal and vertical line segments, etc.

Reductions and NP-Completeness**:** introduction, examples of reductions, reductions involving linear programming, reductions for lower bounds, polynomial-time reductions, nondeterminism and Cook's Theorem, examples of NP-completeness Proofs, techniques for dealing with NP-complete problems, etc.

Parallel Algorithms**:** introduction, models of parallel computation, algorithms for shared-memory machines, algorithms for interconnected networks, systolic computation, etc.

Recommended Books:

1. D. E. Knuth : The Art of Computer Programming, Vol. 1, Fundamental Algorithms.
2. D. E. Knuth : The Art of Computer Programming, Vol. 2, Seminumerical Algorithms.
3. D. E. Knuth : The Art of Computer Programming, Vol. 3, Sorting and Searching.
4. Goodman : Introduction to Design and Analysis of Algorithms.
5. Robert Sedgewick : Algorithms.
6. E. Horowitz and S. Sahni : Fundamentals of Computer Algorithms.
7. Thomas H. Kormen : Introduction to Algorithms
8. Horowitz and Shahny : Analysis of Algorithms
9. Udi Manber : Introduction to Algorithms: A Creative Approach (Hardcover), Addison Wesley (January 1, 1989).
10. Leendert Ammeraal : Algorithms and Data Structures in C++, Wiley.
11. T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein : Introduction to Algorithms, 2nd edition, McGraw-Hill, New York, 2001.
12. M.R. Garey and D.S. Johnson : Computers and Intractability: A Guide to the Theory of NP-Completeness, W.H. Freeman, San Francisco, CA, 1979.
13. Anany V. Levitin : Introduction to the Design and Analysis of Algorithms *(Paperback)*, Addison Wesley; 1st edition (October 30, 2002).
14. Timothy Budd : Data Structures in C++: Using the Standard Template Library *(STL)*, Addison Wesley.

CSE-222 Algorithm Analysis and Design LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-221

ECO-223 Economics
Credits: 2, Hours/Week: 2

Definition of Economics; Economics and engineering; Principles of economics.

Micro-Economics: Introduction to various economic systems capitalist, command and mixed economy; Fundamental economic problems and the mechanism through which these problems are solved; Theory of demand and supply and their elasticities; Theory of consumer behavior; Cardinal and ordinal approaches of utility analysis; Price determination; Nature of an economic theory; Applicability of economic theories to the problems of developing countries; Indifference curve techniques; Theory of production, production function, types of productivity; Rational region of production of an engineering firm; Concepts of market and market structure; Cost analysis and cost function; Small scale production and large scale production; Optimization; Theory of distribution; Use of derivative in economics: maximization and minimization of economic functions, relationship among total, marginal and average concepts.

Macro-Economics: Savings; investment, employment; National income analysis; Inflation; Monetary policy; Fiscal policy and trade policy with reference to Bangladesh; Economics of development and planning.

Recommended Books:

1. **Case & Fair;** Principles of Economics, Pearson – Prentice Hall, Seventh or 8th Edition.
2. **William Boys & M Melvin,** Fundamentals of Economics, 2005.
3. **D. Salvatore,** Introduction to Intern. Economics, 2008.

BDS-224 Bangladesh Studies
Credits: 2, Hours/Week: 2

Location, Geomorphic Characteristics of Bangladesh: The setting, climate, river system, physiographic division, forest, natural disaster;

Settlements and Growth of Bengal: Origin of the name – “Bangla”, ancient Bengal (750 – 1203 A.D), medieval Bengal (1204 – 1757 A.D), modern Bengal (1757 – present);

Liberation War of Bangladesh: Nationalism, background of liberation war and emergence;

Bangladesh Society: Characteristics, culture, factors and forces of change, ethnic groups;

Politics of Bangladesh: Political culture, political parties and their role;

Economy of Bangladesh: Major economic sectors, government’s strategy;

Bangladesh: Constitution, organs of government, government structure (central government, local government);

E-Governance and Bangladesh: Concept and components, implications, prerequisites.

Recommended Books:

1. **A F Salahuddin Ahmed and Bazlul Mobin Chowdhury**, Bangladesh National Culture and Heritage.
2. **Sirajul Islam**, History of Bangladesh.
3. **Kazi S. M. Khasrul Alam Quddusi**, E-governance: Interpretations, Implications & Imperatives.
4. **Salimul & Atiq Rahman**, Environmental Profile of Bangladesh.

MATH-225 Complex Variables and Geometry
Credit: 3, Hours/Week: 3

Complex Variable: Complex number system; General functions of a complex variable; Limits and continuity of a function of complex variable and related theorems; Complex differentiation and the Cauchy Riemann Equations; Mapping by elementary functions; Line integral of a complex function; Cauchy Integral Theorem; Cauchy Integral Formula; Liouville Theorem; Taylor Theorem and Laurent Theorem. Singular points; Residue; Cauchy Residue Theorem. Evaluation of residues; Contour integration; Conformal mapping.

Co-ordinate Geometry: Transformation of co-ordinates axes and its uses; Equation of conics and its reduction to standard forms; Pair of straight lines; Homogeneous equations of second degree; Angle between a pair of straight lines; Pair of lines joining the origin to the point of intersection of two given curves, circles; System of circles; Orthogonal circles; Radical axis, radical center, properties of radical axes; Coaxial circles and limiting points; Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates; Tangents and normals, pair of tangents; Chord of contact; Chord in terms of its middle points; Pole and polar parametric co-ordinates; Diameters; Conjugate diameters and their properties; Director circles and asymptotes.

Recommended Books:

1. Complex variable (S. series).
2. **M.L. Khanna**, Complex variable.
3. **Rahman and Bhattacharjee**, A text book on co-ordinate geometry.

CSE-226 Computer Architecture and Organization
Credits: 3, Hours/Week: 3

The evolution of computers: The nature of computer, the first generation, the latter generation, recent development.

Processor Design: Introduction: Processor organization, information representation, number formats; Fixed Point Arithmetic: Addition, subtraction, multiplication, division; ALU Design: Basic ALU organization, floating point arithmetic.

Control Design: Hardwired control: Design methods, multiplier control unit, CPU control unit; Basic concept of Micro programmed Control, Control memory optimization.

Memory Devices and its Organization: Different types of semiconductor memory, magnetic memory, optical memory, virtual memory, memory hierarchies; High-speed Memories: Interleaved memories, caches, associative memories.

System Organization: Communications: Introduction, bus control; IO Systems: Programmed IO, DMA and interrupts, IO processors.

Parallel Processing: Basic Concepts: Introduction to parallel processing. RISC processor, introduction, data dependency, addressing modes, condition codes, register sets, brief study of standard RISC processor.

Recommended Books:

1.	V. Hamacher, Z. Vranesic and S. Zaky	:	Computer Organization. 3rd ed., McGraw-Hill, 1988.
2.	J.P. Hayes	:	Computer Architecture and Organization, 2nd ed., McGraw-Hill, 1992.
3.	K. Hwang and F.A. Briggs	:	Computer Architecture and Parallel Processing, McGraw-Hill, 1986.
4.	W. Stallings	:	Computer Organization and Architecture.

STAT-227 Statistics and Probability
Credits: 3, Hours/Week: 3

Introduction**:** Definition and characteristic features of the science of statistics, Main divisions of statistical theory.

Frequency Distribution and Measures of Location**:** Frequency distributions, Graphical Representation of Frequency distributions, Forms of Frequency Curves, Caparison of frequency distribution, Measures of Location or Measures of central tendency, Requisites for an ideal measure of central tendency.

***Measures of Dispersions, Skewness & Kurtosis, Moment of Frequency distribution*:** Measures of dispersion, characteristics of an ideal measure of dispersion, moments, Sheppard's corrections to moments of grouped frequency distributions, symmetrical and skewness, kurtosis, Pearson's β-and γ -coefficients, Factorial and absolute moments.

***Theory of Probability*:** Random experiments, Sample Space, Events, Algebra of events, Types of events, Mathematical and statistical definition of probability, Theorem of total probability, its generalization and geometrical interpretation, Boole's inequality; Theorem of compound probability; Conditional Probability, Independence of events, Bayes theorem.

***Random Variables*:** Discrete random variable; Probability mass function and distribution function; Mathematical expectation; Covariance; Conditional expectation, Conditional variance, Moments generating function, Cumulants

***Discrete Probability Distributions*:** Binomial distributions, First four moments of the binomial distribution, Moment generating and cumulative functions of the binomial distribution, Poisson distribution, Derivation of Poisson distribution from Binomial distribution, Moment generating and cumulative functions of the Poisson distribution Mean and variance of the Poisson distribution, Mode of the Poisson distribution, Negative Binomial distribution;.

***Continuous Probability Distributions*:** Univariate distribution, Definition of moments, etc for univariate continuous probability distributions, Normal distribution, Chief features of the normal curve, Some properties of the Normal distribution, Normal approximation to the Binomial distribution, Moment generating function.

***Correlation and Regression*:** Correlation coefficient, Bivariate frequency distribution, Linear and curvilinear regression, Standard error of estimate, Correlation of ranks, Correlation ratio, Bivariate normal distribution, Properties of Normal Correlation Distribution, Intra-class correlation coefficient.

***Discrete-Parameter Markov Chains*:** Introduction, Probability vectors, Stochastic processes, Stochastic matrices, Definition of Markov chain, Computation of n-step transition probabilities, State classification and limiting distributions, Distribution of times between state changes, Absorbing states, Finite Markov chain with absorbing states.

***Statistical Software*:** Introduction to SPSS.

Recommended Books:

1. **Kapur, J. N. and Saxena, H. C.,** Mathematical Statistics
2. **Weatherburn, C. E.,** A First Course in Mathematical Statistics
3. **Marek Fisz,** Probability and Mathematical Statistics
4. **Gupta, S. C. and Kapoor V. K.,** Fundamentals of mathematical Statistics
5. **Manindra Kumar Roy,** Fundamentals of Probability & Probability Distributions

CSE-228 Java Technologies
Credits: 2, Hours/Week: 2

An Introduction to Java. The Java Programming Environment, Fundamental Programming Structures in Java, Object and classes, Inheritance. Interfaces and Inner Classes Graphics Programming, User Interface Components with swing, Applets, Exceptions and Debugging, Streams and Files. Controlling Program Flow, Initialization & Cleanup, Hiding the implementation. Ressing classes, Polymorphism, Interfaces & Inner Classes, Holding your objects, error handling with exceptions, The Java I/O system, Run-time type Identification, Creating windows & Applets, Multiple Threads, Distributed Computing, Enterprise Java frame work, application model, multi-tier application, Java servelets, Java server pages and Beans.

Recommended Books:

1. H. M. Deitel P. J. Deitel : Java How To Program
2. Sun Press : Core Java(Vol-1&2)
3. Ivor Horton : Beginning Java 2, Wrox
4. H. Schildt : Java 2 Complete Reference, Jessey
5. H. M. Deitel P. J. Deitel : Java How To Program

CSE-229 Java Technologies LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-228

Viva voce
Credits: 0.5

At the end of semester final examinations, interview in front of the board of examiners based on the courses of the corresponding semester.

Third Year First Semester

CSE-311 Theory of Computation
Credits: 2, Hours/Week: 2

The Central Concepts: Introduction to Finite State Machines and Finite State Automata; Alphabets, Strings and Languages.

Finite Automata: Deterministic Finite Automata, Non-deterministic Finite Automata, and their applications; Finite Automata with Epsilon-Transitions.

Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, and Algebraic Laws for Regular Expressions.

Properties of Regular Languages: The Pumping Lemma for Regular Languages and its applications; Closure Properties and Decision Properties of Regular Languages; Equivalence and Minimization of Automata.

Context-Free Grammars and Languages: Context-Free Grammars; Parse Trees; Applications of Context-Free Grammars; Ambiguity in Grammars and Languages.

Pushdown Automata: Definition and the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata.

Properties of Context-Free Languages: Chomsky and Greibach Normal forms for CFG's; The Pumping Lemma for CFL's; Closure and Decision properties of CFL's.

Computability Theory: The Church-Turing thesis, Turing machines, variants of Turing machines, the definition of algorithm- Hilbert's problems, etc.; Decidability: decidable languages, the Halting problem, etc.; Turing reducibility, a definition of information, etc.

Recommended Books:

1. Introduction to Automata Theory, Languages & Computation, **Hopcropt, J.E. & Ullman , J.D.**
2. Elements of the Theory of Computation, **Lewis Papadimitriou**
3. Introduction to Languages and Theory of Computation, **John C Martin**

CSE-312 Database Management System
Credits: 3, Hours/Week: 3

Introduction to database system: Overview, File system VS database system, Advantage of a DBMS, Describing and storing in a DBMS, Queries in a DBMS, Transaction management, Structure of a DBMS, Applications.

The Entity-Relationship model: Basic concept, Design issue, Mapping constraints, Keys, E-R diagram, Weak entity sets, Extended E-R features, Design of an E-R database schema, Reduction of a E-R schema to tables.

Relational model: Structure of relational databases, The relational algebra, The tuple relational calculus, the domain relational calculus, relational algebra operations, modification of the database, introduction to views.

Structured Query Language: The form of a basic SQL query, UNION, INTERSECTION and EXCEPT, nested queries, aggregate operations, null values, embedded SQL, cursors, dynamic SQL, ODBC and JDBC, triggers and active database.

Relational database design: Pitfalls in relational database design, Decomposition, normalization using functional dependencies, normalization using multivalued dependencies, normalization using join dependencies, domain-key normal form.

Object oriented and object relational databases: The object oriented data model, nested relations, complex types and object orientation, querying with complex types, creation of complex values and objects.

Storage and file structure: Overview physical storage media, file organization, organization of records in files, data-dictionary storage.

Query processing: Catalog information for cost estimation, measuring of query cost, different operations, evaluation of expressions, choice of evaluation plans.

Concurrency control: Lock based protocols, timestamp based protocols, validation based protocols, multiple granularity, multiversion schemes, deadlock handling, insert and delete operations.

Recovery system: Failure classification, storage structure, recovery and atomicity, log-based recovery, shadow paging, recovery with concurrent transactions, buffer management, advanced recovery techniques.

Database system architecture: Centralized systems, client-server systems, parallel systems, distributed systems, network types

An introduction to parallel and distributed database: Oracle: introduction to SQL plus, PL/SQL, triggers, forms, reports, query, procedures, and project builder.

Case study: MS SQL server, My SQL server.

Recommended Books:

1.	A. Silberschatz	: Database System Concepts.
2.	R. Ramakrishnan	: Database Management System
3.	James Martin	: Principles of Database Management.
4.	Uillman	: Database Management systems.
5.	Abey	: Oracle 8i a Beginners Guide

CSE-313 Database Management System LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-312

CSE-314 System Analysis and Design
Credits: 3, Hours/Week: 3

Introduction: Information systems, General design consideration of information systems.

Overview: System concepts and the information systems environment, information needs, the concept of MIS, decision support systems, executive information systems, data warehousing, the system development life cycle, the role of system analyst.

System analysis: System planning and the initial investigation, information gathering, the tools of structured analysis, feasibility study, cost/benefit analysis.

System design: The process and stages of systems design, input/output and forms design, organization and data base design.

System implementation: System testing and quality assurance, implementation and software maintenance, hardware/software selection and the computer contract, project scheduling and software security, disaster recovery and ethics in system development.

Case studies: Various information systems such as: Library management system, inventory system, voter identity management system, payroll system etc.

Recommended Books:

1. Systems Analysis and Design, **E. M. Awad**.
2. System Analysis & Design, **P. Edwards**.
3. Principles of Management Information System, **G. Scott**.

CSE-315 Project Work
Credits: 0.75, Hours/Week: 3/2

Students will have to complete a short project work under the supervision of an appointed supervisor based on CSE-312 and CSE-314.

CSE-316 Data and Telecommunication
Credits: 3, Hours/Week: 3

Introduction: Data and signal, Basic data communication system, Transmission impairments, Data rate, Bandwidth and channel capacity.

Transmission media: Two-wire cable, coaxial cable, optical fiber. Radio waves, satellite communication.

Data encoding techniques: AM, FM, PM. ASK, FSK, PSK, QPSK. PCM, DM. NRZL, NRZI, Bipolar AMI, Pseudotemetry, Manchester and differential Manchester encoding.

Data transmission techniques and multiplexing: Asynchronous and synchronous transmission. Simplex, Duplex, Full duplex transmission. Frequency division and time division multiplexing. Carrier system.

Error detection techniques: Parity check, Longitudinal Redundancy check and CRC. Data link and error control protocol: Basic characteristics, Flow and error control techniques, Framing. Stop and wait ARQ, HDLC protocol.

Telecommunication: Introduction, simple telecommunication system. Basic of a switching system.

Telecommunication network: Major telecommunication network, Data transmission and data rates in PSTN. Switching techniques of PSTN, Public Telecommunication network, Cellular telephony and Satellite network.

ISDN: Motivation and protocol for ISDN, ISDN standard, Expert system in ISDN. ISDN channel and broadband ISDN. Transmission channel, Signaling, Numbering and addressing of ISDN.

Antenna: Radiation from a current element, Antenna equivalent circuit, Dipole antenna.

Recommended Books:

1. **Stallings W**, Data Communications and Computer Networks
2. **William A Shay**, Understanding Data Communication & Networks
3. **S. E. Matter & A. G Chynoweth**, Optical fibre telecommunication
4. **M. S. Roden**, Analog and Digital communication Systems
5. **Roddy and Coolen**, Electronic Communications

CSE-317 Data and Telecommunication LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-316

CSE-318 Microprocessor and Assembly Language
Credits: 3, Hours/Week: 3

Microprocessor Fundamentals, Architecture of a microprocessor, Data bus, address bus, control bus, I/O units and memory, Review of some important components, Decoder, Encoder, Multiplexer, Demultiplexer.

Architecture of Intel 8085 Microprocessor, Demultiplexing of Lower-order address-bus. Generating control signals, Timing diagram of memory read /write operation Address decoding, Partial and absolute Address decoding, I/O port design for simple application.

Architecture of Intel 8086 Microprocessor, its execution unit and bus-interface unit, its registers and flags. Comparison between Intel 8085 and 8086 Microprocessor.

Programming model of 8086 processor, segment-offset address and physical address calculations, even and odd addressing, introduction of different addressing modes, Operating systems and BIOS, Memory organization of PC.

Introduction to IMB PC Assembly Language, Assembly Language syntax, Program Data, Variables, Named constants, program structure, memory models, Input/Output instruction, Running program, Program Segment Prefix.

The processor status and the Flag register, Overflow condition, Debugging a program.

Flow control instructions, Conditional jumps, signed versus unsigned jumps, High-level language structures, branching and looping structures.

Logic, Shift and Rotate Instruction, some common applications of Shift and Rotate operations.

The Stack and Introduction to Procedures, Basic stack operations, Procedures Declaration, Communication between procedures, calling a procedures.

Multiplication and Division Instructions, signed versus unsigned multiplications, Divide overflow, Signed Extension of Dividend.

Arrays and related addressing modes, DUP operator, Register indirect modes, Based and Indexed Addressing modes, PTR operator, Based-indexed addressing modes, XLAt instruction.

The string instructions, director flag, Moving a string, storing a string, Loading a string, scanning a string, comparing strings, substring operation.

Text display and keyboard programming, the monitor, Video adapter and display modes, text mode programming, keyboard buffer and operation, scan codes.

Recommended Books:

1. Rafiquzzaman : Microprocessor and Microcomputer based system design
2. D. V. Hall : Microprocessors and Interfacing, McGraw-Hill, 1987.
3. Y. Liu and G. A. Gibson : Microcomputer Systems: 8086/8088 Family, Prentice-Hall, 1991.
4. Artwick : Microcomputer Interfacing
5. Ramesh Goanker : Microcomputer Interfacing
6. James E. Powell : Designing User Interfaces

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CSE-319 Assembly Language LAB
Credits: 1, Hours/Week: 3

Laboratory Works based on CSE-318

Viva-voce
Credits: 0.5

At the end of semester final examinations, interview in front of the board of examiners based on the courses of the corresponding semester.

Third Year Second Semester

CSE-321 Computer Peripherals and Interfacing
Credits: 2, Hours/Week: 2

Input devices: Keyboard; Key switching mechanism and coding techniques; Static encoder; Lockout and rollover; Scanning encoder.

Modern data-entry devices: Scanners overview; Bar code reader; Optical mark reader (OMR); Optical Character Reader (OCR); Digitizer: Reading technique.

Display devices: CRT; Basic CRT operations; Timing and frequencies; CRT controller ICs; LCDs; LCD technologies; Passive and active matrix; Guest-host techniques; Twisted-pneumatic LCDs; LCD reliability; Electroluminescent display.

Printers: Impact printers; Serial and line printing; Laser printing; Ink-Jet printing; Color printing; Plotters.

Storage devices: Magnetic hard disk and controller; Compact disk (CD), magnetic tape storage, DVD.

Basic Concepts of Interfacing: concepts of microprocessor interfacing, reviews of address decoding concepts, Interfacing peripherals, Peripheral I/O and memory mapped I/O, Interfacing with external memory, microprocessor controlled data transfer and peripheral controlled data transfer.

Intel 8085 Microprocessor Interfacing: Peripheral I/O instruction for Intel 8085 Microprocessor and its timing diagram. Interfacing I/Os using decoder, interfacing with LED and seven segment display, Interrupts, 8080A interrupts, RST instructions, Application examples of 8085 Interrupts.

Interfacing data conversion: Digital to Analog converters, R/2R Ladder, Microprocessor compatible D/A converters, AD 7522, Analog to Digital Converters, Software controlled A/D converters, Interfacing A/D converters, Successive-approximation A/D converters, AD570, Dual slope A/D converter, ADC 0801.

Programmable Interfacing Devices: general-purpose programmable peripheral devices, 8255 Programmable peripheral interface, Block diagram of 8255, its different mode of operation, Interfacing A/D converter using 8255, Application of 8255 in Handshake mode, 8253 Programmable interval timer, programming 8263, 8253 as counter, 8259 programmable interrupt controller and its priority mode and other features, programming the 8259, 8257 DMA controller and its block diagram, example of application of 8257 DMA controller.

Processor and I/O communication: Synchronous and asynchronous transmission, Parity check, BAUD, RS 232 standard, 8251 programmable communication interface and its block diagram, interfacing RS 232 Terminal using the 8251A.

Recommended Books:

1. **Mohamed Rafiquzzaman, Ph. D.,** Microprocessors and Microcomputer-Based System Design, 1995.
2. **Ramesh Goanker,** Microcomputer Interfacing
3. **Yu-cheng Liu, Glenn A. Gibson,** Microcomputer Systems: The 8086/8088 Family, 1986.
4. **Artwick,** Microcomputer Interfacing
5. **Douglas V. Hall**, Microprocessors and Interfacing: Programming and Hardware, 1994.
6. **James E. Powell,** Designing User Interfaces

CSE-322 Interfacing and Microcontroller LAB
Credits: 1.5, Hours/Week: 3

Laboratory Works based on CSE-321

CSE-323 Software Engineering
Credits: 3, Hours/Week: 3

Software Engineering Paradigms: Definition of S/W Engineering; The classical life cycle; Prototyping fourth generation technique; The product and the process, measurement, matrices.

Requirements Analysis Fundamentals: Analysis principle; Software prototyping specification; Requirement analysis methodologies; Structured and object oriented analysis; Data flow-oriented analysis methods.

Software Design Fundamentals: Design process; Design fundamentals: S/W architecture program structure; data structure, S/W procedure, modularity, abstraction; Effective modular design; Procedural design; Data flow-oriented Design; Top-down and bottom-up design; Design process considerations; Transform analysis; Transaction analysis; Data structure-oriented design: Logical construction of programs and systems, Data structured systems development; object-oriented design; Design concepts; Methods; Strategy; Real-time Design; Coding style: Code documentation, Data declaration, Statement construction, Input/output.

Software Testing Techniques and Strategies: Testing fundamentals; White box testing; Basis path testing; Loop testing; Black Box testing; Verification and validation; Organization for software testing; Credit testing; Integration testing; Validation testing; System testing; The art of debugging.

Formal Methods and Specification Language: Formal specification rationale; Introduction to predicate calculus; Formal specification techniques; Pre/post conditions, Algebraic specification; Format (Signature, axioms); Steps in definition; Structured algebraic specification; Introduction to specification language Z; Steps in Z; Logic.

Recommended Books:

1. **Ian Sommerville**, Software Engineering, 5th Edition, LPE, Edition Wesley Publishing Company, 2000.
2. **Roger S. Pressman**, Software Engineering, McGraw=Hill International Edition, 2001.
3. **David Alex Lamb**, Software Engineering, Prentice-Hall International Editions, 1998.

CSE-324 Ecommerce

Credits: 2, Hours/Week: 2

E-Commerce Basics: E-Commerce Definition, Internet History and E-Commerce Development, Business-to-Business ECommerce, Business-to-Consumer E-Commerce, E-Commerce Stages and Processes, E-Commerce Challenges, Ecommerce Opportunities.

E-Commerce Options: Internet Access Requirements, Web Hosting Requirements, Entry-Level Options, Storefront and Template Services, E-Commerce Software Packages, E-Commerce Developers, E-Business Solutions.

Marketing Issues: Online and Offline Market Research, Data Collection, Domain Names, Advertising Options, E-Mail Marketing, Search Engines, Web Site Monitoring, Incentives.

Planning and Development: Web Site Goals, International Issues, Planning Stages, Resource Allocation, Content Development, Site Map Development, Web Site Design Principles, Web Site Design Tools, Web Page Programming Tools, Data-Processing Tools. E-Commerce Components: Navigation Aids, Web Site Search Tools, Databases, Forms, Shopping Carts, Checkout Procedures, Shipping Options. .

Payment Processing: Electronic Payment Issues, E-Cash, Credit Card Issues, Merchant Accounts, Online Payment Services, Transaction Processing, Taxation Issues, Mobile Commerce (M-Commerce).

Security Issues: Security Issues and Threats, Security Procedures, Encryption, Digital Certificates, SSL and SET Technologies, Authentication and Identification, Security Providers, Privacy Policies, Legal Issues.

Customer Service: Customer Service Issues, E-Mail Support , Telephone Support , Live Help Services, Customer Discussion Forums, Value-Added Options.

Recommended Books:

1. **Jeffrey F., Rayport, Bernard J. Jaworsk :** E-Commerce, Mc Graw-Hill, ISBN-0072465212, 1st Edition.
2. **David Kosiur :** Understanding Electronic Commerce, Microsoft Press.
3. **Jeffrey F. Rayport, et al. :** Introduction to E-Commerce, Mc Graw-Hill, 1st Edition Aug-13, 2001.
4. **Debra Cameron :** E-Commerce Security Strategies: Protection the Enterprise, Computer Technology Research Corp. Aug-1998.
5. **Charles Trepper :** E-Commerce Strategies
6. **SAMS Publisher :** Web programming A desktop Reference

CSE-325 Operating Systems and System Programming

Credits: 3, Hours/Week: 3

Introduction: Evolution, Goals and Components of OS, Types of OS. Operating System Services

Process management: Process states and state transition, Process Control Blocks, Job and Process scheduling, Process Communication, Threads

CPU Scheduling: Scheduling levels, Objectives and criteria, CPU scheduling algorithms, Algorithm Evaluation

Process Synchronization: Process co-ordination, Critical section problems, Semaphores, Monitors, Classical problems of process synchronization.

Deadlock: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, avoidance, and detection, Recovery form deadlock, Deadlock handling.

Memory management: Logical and Physical Address Space, Swapping, Memory allocation schemes, Paging and Segmentation, Segmentation with Paging

Virtual memory: Demand paging, Performance of Demand Paging, Page replacement algorithms, Allocation of frames, Demand Segmentation

Secondary storage management: Disk structure; Disk scheduling, Disk management, Swap-space management, Disk reliability, Stable storage implementation

File-System: File and Directory concept, File system structure, Allocation method, Free space Management, Directory Implementation.

Protection and Security: Goals of protection, principle of protection, Access matrix, Access Control, Security problems and Threats, Computer Security, Implements Security Defenses,

Unix O/S: Overview, system structure, user perspective, O/S services, Introduction to the kernel and buffer cache, internal representation of files, Compiler, Loader, Linker, System call, Remote procedure call, Unix socket, Multithreading.

Recommended Books:

1. **Silberschatz and Galvin**, Operating System Concepts
2. **Stalling, William**, Introduction to Operating System
3. **Milenkoviæ, Milan**, Operating Systems: Concepts and Design
4. **Tanenbaum, Andrew S.**, Modern Operating Systems
5. **Terrence**, Unix System Programming in C++

CSE-326 Operating Systems and System Programming LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-325

CSE-327 Project Work
Credits: 0.75, Hours/Week: 3/2

Students will have to complete software oriented short project work under the supervision of an appointed supervisor based CSE-323.

CSE-328 Computer Networks
Credits: 3, Hours/Week: 3

Introduction: Introduction to Computer Networks, Network Goals and Applications, Network Architectures, OSI reference model, TCP/IP model and terminology, Connectionless and Connection Oriented services, Network Topologies, Service primitives, Public Networks, The ARPANET, SNA.

Physical Layer: Circuit switching and Packet switching, X-25 protocol, ISDN, BISDN, Frame relay and Cell relay.

Medium Access Sublayer: Static and Dynamic channel allocation in LAN and MAN, LAN Cables, Pure and slotted ALOHA, Persistent and Non persistent CSMA, CSMA with collision detection and collision free protocols, IEEE standard 802.3 and Ethernet, Token Bus and Token Ring, FDDI, Fibernet II, DATAKIT.

Data Link Layer: Service provided to the network layer, Framing, Flow control, Error detecting and Correcting Codes, Stop-and-Wait protocol, Sliding Window protocol, Go Back n protocol, Selective Repeat protocol, Performance of Stop-and Wait and Sliding Window protocol, Data Link layer in Public network and ARPANET.

Network Layer: Service provided to the Transport layer, Internal organization of Network layer, Routing algorithms, Internetworking, Router, Bridge, Gateway, Network layer in Public network and ARPANET.

Transport Layer: Services provided to the Session layer, Quality of service, Transmission Controls protocols, Connection management, Addressing, Establishing and Releasing Connection, Flow control and Buffering, Multiplexing, Transport layer in Public network and ARPANET.

Session Layer: Services provided to the Presentation layer, Data exchange, Synchronization, Dialog and Activity management, OSI session service primitives.

Presentation Layer: Data Compression techniques, Frequency Dependent Coding, Context Dependent Encoding, Cryptography, Traditional Cryptography, Data Encryption Standard, Public key cryptography, MIT algorithm.

Application Layer: File transfer Access and management, Electronic Mail, Virtual Terminal, Client Server, Other applications, OSI service elements.

Internet: Introduction to internet and intranets, internet protocols, Internet services and goals, Domain Name System (DNS) and Addresses, FTP, Gopher and Telnet, World Wide Web (WWW), Internet Relay Chat (IRC), USENET, DHCP and BOOTP.

Recommended Books:

1. A.S. Tanenbaum : Computer Networks
2. G. H. Cady, Pat McGregor : Mastering The Internet
3. Barry Nance : Introduction to Networking
4. W. Stallings, Macmillan : Data and Computer Communications
5. F. Halsall : Data Communications, Computer Networks and Open Systems
6. Sydni Feit : TCP/IP

CSE-329 Computer Networks LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-328

Viva-voce
Credits: 0.5

At the end of semester final examinations, interview in front of the board of examiners based on the courses of the corresponding semester.

Fourth Year First Semester

CSE-411 Artificial Intelligence and Expert System
Credits: 3, Hours/Week: 3

Introduction: Introduction to AI and intelligent agents, General Concept of Knowledge.

Symbolic Knowledge and Reasoning: Building a Knowledge Base Agent, Propositional logic, First order logic, Inference in First order Logic.

Uncertain Knowledge and Reasoning: Inconsistencies and uncertainties, probabilistic reasoning, Structured knowledge, Fuzzy Logic.

Knowledge Organization and manipulation*:* Search strategies, Game planning, Knowledge Organization and management.

Knowledge acquisition: Introduction, Types of learning, general model, Learning automata, Genetic algorithm, Learning by Induction.

Introduction to Natural Language Processing: Overview of Linguistics, Grammars and Languages, Basic Parsing Techniques, Semantic Analysis & Structures, Natural Language generation and Systems.

Expert System: Expert consultation, Development of Expert Systems, Computer vision, Robotics.

Logic programming*:* Background, Representation and reasoning, Logic programs and programming styles, Programming in PROLOG. List processing, arithmetic, I/O and memory operations and databases in PROLOG. User interface and interface engine of AI.

Recommended Books:

1. **Dan w. Patterson,** Introduction to Artificial Intelligence and Expert System
2. **Stuart Russell and Peter Norving**, Artificial Intelligence: A Modern Approach
3. **E. Rich and K. Knight**, Artificial Intelligence.

CSE-412 Artificial Intelligence and Expert System LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-411

CSE-413 Compiler Design
Credits: 3, Hours/Week: 3

Introduction: Phases of a compiler (lexical analyzer, syntax analyzer, semantic analyzer, intermediate code generator, code optimizer, code generator, symbol-table manager & error handler).

Lexical analysis: role, finite automata, from regular expression to NFA, from NFA to DFA, design of a lexical anlyzer generator using LEX.

Syntax analysis: role, CFG, writing a grammar, top-down parsing, bottom-up parsing, operator precedence parsing, LR parser, using ambiguous grammar, parser generators (YACC).
Symbol table, structure and management.

Intermediate code generation: intermediate languages, declarations, assignment statement, Boolean expression, case statements, backpatching, procedure calls.

Code optimization: principle of source optimization, optimization of basic blocks, loop in flow graphs, global data flow analysis, iterative solution of data flow equations.

Code generation: Issues in the design of a code generator, target machine, runtime storage management, basic blocks and flow graphs, register allocation and assignment, dag representation of basic blocks, peephole optimazations, generating code from dags.

Recommended Books:

1. **Hopcroft and Ullman**, Introduction to Automata Theory, Languages and Computation
2. **Adamek**, Automata and Algebra
3. **Aho and Ullman**, Principles of Compiler Design
4. **Lewis and Stern**, Compiler Design Theory.

CSE-414 Compiler Design LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-413

CSE-415 Digital Signal Processing
Credits: 3, Hours/Week: 3

Introduction to Signals: Concepts of signals, systems and signal processing; classification of signals; Digital signals and systems; Classification of discrete time signals; Sampling theorem; Fourier series and Fourier transform; Autocorrelation.

***The Z-Transform**:* The Z-Transform and its properties; The inverse Z-Transform.

The Discrete Fourier Transform (DFT): The Discrete Fourier Transform (DFT), redundancy in the DFT; The Fast Fourier Transform (FFT); the FFT decimation in time & decimation in frequency; Interrelationship between the DFT & Z-transform; Convolution of sequences & sectioning.

Digital Filter: Digital Filter characterization; Digital filter structures; Design of Digital Filters; Recursive Filter design; Effects of finite word length; Simple models for quantization noise in recursive systems; Non-recursive filter design via the DFT computational techniques; Other radix formulations; Other radix formulations; Spectral analysis using the FFT; Speech processing algorithms;

Recommended Books:

1. Digital Signal Processing, **Proakis & Manolakis**
2. Digital Image Processing, **R Gonzalez, E Woods**
3. Discrete Time Signal Processing, **Oppenheim & Schafer**
4. Elements of Image Processing, **Anil**

CSE-416 Computer Graphics
Credits: 3, Hours/Week: 3

Introduction: A survey of Computer Graphics, Overview on basic components of Computer Graphics, Graphics Input devices, Architecture of Graphics display devices, Video memory.

Fundamental Graphics Algorithms: Scan Conversion of Points and Lines, Line drawing algorithm, DDA algorithm, Bresenham's Line algorithm, Bresenham's circle drawing algorithm, Loading the frame buffer, circle generating algorithm, Midpoint circle algorithm, Ellipse generating algorithm, Midpoint Ellipse algorithm, pixel addressing, Region Filling algorithms.

Clipping Operations: Point clipping, line clipping, polygons clipping, curve clipping, text clipping

Implementation of Computer Graphics: Co-ordinates Transformations, Two and Three dimensional Transformation, Viewing and Clipping, Projections, 3D object representations, Curves and Surface Design, Elimination of Hidden surfaces, Z-buffer algorithm, Painters algorithm, scan-line algorithm, Vector mathematics method, Raster graphics systems, Image synthesis methods, Ray tracing, Shadow mapping, color and shading models.

Recommended Books:

1. Steven Haringtron : Computer Graphics a Programming Approach, Second Edition, 1987.
2. Hearn and Baker : Computer Graphics.
3. F. S. Hill : Fundamentals of Computer Graphics.
4. Plastock and Kalley : Computer Graphics.
5. Zhigang Xiang & Roy Plastock : Computer Graphics.

CSE-417 Computer Graphics LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-416

CSE-418 Web Engineering
Credits: 2, Hours/Week: 2

Information and Distributed Systems Infrastructure: Basic Terminology, Networks, Internet, Intranet and Extranet, Client/Server Computing Paradigm, Open Systems and Communication Protocols, Middleware: Views, Definitions, Functions, Client/Server Working Mechanism: Application Programming Interface (API), Sockets, Client and Server Implementation.

Web and Programming: Web Elements: Browser and Web Document. Static, Active and Dynamic pages, Programming paradigms and Web programming. Object-oriented vs. Object-based programming, What should and should not be programmed on the Web, Tasks suitable for programming on the Web, Choice of programming language for Web programming.

Client-side Programming: JavaScript for Web Programming: Introduction to the Language, JavaScript: Object Hierarchy and working with objects, JavaScript: Event-Driven Programming,

Server-side Programming: Approaches to running Server Programs, The Classic Technology: Common Gateway Interface (CGI): Definition, Characteristics, CGI Programming Mechanism: GET and POST methods, Simple examples using Perl, Introduction to PHP Programming Language. PHP for Web Programming

Recommended Books:

1. **A. Berson:** Client/Server Architecture, 2nd ed., McGraw-Hill Series on Computer Communication.
2. **Chris Bates:** Web Programming. Building Internet Applications, 2nd ed., John Wiley & Sons, Ltd., 2002.
3. **Douglas E. Comer:** Computer Networks and Internets with Internet Applications, 3rd ed., Prentice Hall International, Inc., 2001.

CSE-419 Project or Thesis Work - I
Credits: 3, Hours/Week: 6

Student will have to complete a full length project work or thesis under the supervision of an appointed supervisor and this topic will be continued to CSE-428. Students who have CGPA 3.00 or above at the end of 3rd year 2nd semester can take thesis as partial fulfillment of the requirements for the degree. Students who have CGPA below 3.00 at the end of 3rd year 2nd semester have to take project work as partial fulfillment of the requirements for the degree.

Viva-voce
Credits: 0.5

At the end of semester final examinations, interview in front of the board of examiners based on the courses of the corresponding semester.

Fourth Year Second Semester

CSE-421 Digital Image Processing
Credits: 3, Hours/Week: 3

Fundamentals of Image processing: What is Digital Image processing? Origins of image processing, Fundamental steps in image processing, Components of image processing, Elements of visual perception, Digital Image representation or simple image formation model, Problems and Applications of image processing, Image sampling and quantization, zooming and Shrinking digital image, Basic relationships between pixels, Neighbours of a pixel, adjacency, connectivity, regions and boundaries, distance measures, Linear and non-linear operations.

Image enhancement: Image enhancement is special domain: Image negative, log transformations, power-law transformations, Piecewise-linear transformation functions, contrast stretching, gray-level slicing, bi-plan slicing, Histogram processing, Histogram equalization, Histogram specification, Image subtraction, Image averaging, Basics of spatial filtering, Smoothing special filters, Sharpening Special filters, Combining special enhancement methods.

Image enhancement in frequency domain: Introduction to the Fourier transform and the frequency domain, the two-dimensional DFT and its inverse, Filtering in the frequency domain: some basic properties of frequency domain, some basic filters and their properties, Correspondence between filtering in special and frequency domains, Smoothing frequency domain filters: ideal low-pass filter Butterworth low-pass filters, Gaussian low-pass filters, Sharpening frequency domain filters: ideal high pass filter, Butterworth high-pass filters, Gaussian high-pass filters, the laplacian in the frequency domain, Implementation.

Image Restoration: Model of the image degradation/ restoration process, Noise models.

Color Image processing: Color fundamentals, Color models: RGB color model, CMY and CMYK color model, HIS color model, converting colors from HIS to RGB, Pseudo-color Image processing, Intensity slicing, Gray-level to color transformations, Basics of full color image processing, Color Transformation, Smoothing and Sharpening, Color segmentation, color edge detection, Noise in color images, Color image compression

Image Compression: Preview, fundamentals, coding redundancy, inter-pixel redundancy, psycho-visual redundancy, Fidelty criteria, Image compression models, Error free compression, Huffman coding, Variable length coding, bit-plane coding. Morphological image processing: Preliminaries, Dilations and Erosion, Some basic morphological algorithms. Image segmentation: detection of discontinuous, point detection, line detection, edge detection, thresholding, region based segmentation.

Matlab: Introduction, Interactive computing, Programming in MATLAB; Script and functions, Applications. Matlab toolboxes (User of); Digital Signal Processing and Image Processing.

Recommended Books:

1. Rafeal C. Gonzalez & Richard E. Woods : Digital Image Processing
2. Gordon E. Carlson : Signal and Linear System Analysis
3. Rudra Pratap : Getting Started with Matlab V6

CSE-422 Pattern Recognition and Neural Networks

Credits: 3, Hours/Week: 3

***Introduction to Pattern Recognition*:** Features, Classification, Learning; Statistical method, structural methods & hybrid method; Application to Hand written character, Speech Recognition, Remote Sensing & biomedical area; Learning algorithms; Syntactic approach; Introduction to Pattern Grammar and Languages; Parsing Techniques; Pattern Recognition in CAD; Recent Trends.

Introduction to Neural Networks: The Basic Neuron, The Multi-layer Perception, Applications of Neural Network, Kohonen Self-Organizing Networks, Hopfield Networks, Adaptive Resonance Theory, Associative Memory. Pattern Recognition by Neural Network theory

Recommended Books:

1. **Beale R and Jackson,** Neural Computing: An Introduction
2. **Igor Aleksander and Helen Morton,** An Introduction to Neural Computing

CSE-423 Pattern Recognition and Neural Networks LAB

Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-422

CSE-424 VLSI Design

Credits: 3, Hours/Week: 3

VLSI design methodology: top-down design approach, technology trends and design automation algorithms; Introduction to CMOS inverters and basic gates; Brief overview of CMOS fabrication process: layout and design rules; Basic CMOS circuit characteristics and performance estimation; Buffer circuit design; Complex CMOS gates, CMOS building blocks: adder, multiplier; data path and memory structures.

Hardware modeling: hardware modeling languages, logic networks, state diagrams, data-flow and sequencing graphs, behavioral optimization.

Architectural Synthesis: circuit specification, strategies for architectural optimization, data-path synthesis, control unit synthesis and synthesis of pipelined circuits. ASIC design using FPGA and PLDs.

Recommended Books:

1. K. Eshraghian & D. A. Pucknell : Basic VLSI design: System & Circuit
2. R. K. Brayton : Logic Minimization Algorithms for VLSI Synthesis.
3. F. Lombardi : Testing and diagnosable Design of VLSI and ULSI.
4. C. A. Mead and L. A. Conway : Introduction to VLSI Systems.

CSE-425 Parallel and Distributed System

Credits: 3, Hours/Week: 3

Introduction: Trends towards Parallel processing, Parallel processing mechanism, Multiprogramming and Time sharing, Parallel Computer Structures, Parallelism and Pipelining, Parallel processing applications, Speedup Performance Laws, Parallel Random Access Machines (PRAM) and VLSI model.

Hardware Technology: Advanced processor Technology, Superscalar and Vector processor, Shared memory organization, Design of Linear and Non linear Pipeline processor, Multiprocessor System Interconnects.

Pipelining and Vector Processing: Principles of Pipelining, Classification of pipelined processors, Instruction and Arithmetic pipeline design, Vector Processing principles, Vector processing requirements, Designing Pipelined processors, Compound Vector processing, Recent Vector processors, Vectorization and Optimization methods.

Parallel Programming: Parallel Programming models, Parallel Languages and Compilers, Code Optimization and Scheduling, Loop Parallelization and Pipelining, Parallel Programming Environments, Shared-variable program structures, mapping programs onto Multicomputers.

Distributed Processing: Introduction, Function distribution, Hierarchical and Horizontal distributed system, Strategies for distributed data processing, Data distribution, Conflict analysis, Distributed Database and applications. Transaction and distributed transaction, concurrency control, security in distributed system.

Parallel and distributed databases: Architecture of parallel databases, introduction to distributed databases, distributed DBMS architectures, storing data in a distributed DBMS, distributed catalog management, distributed query processing, updating distributed data, introduction to distributed transactions, distributed concurrency control, distributed recovery.

Recommended Books:

1.	Kai Hwang (Senior Consulting Edition)	:	Advanced Computer Architecture Parallelism, Scalability, Programmability
2.	Kai Hwang, Faye A. Briggs	:	Computer Architecture and Parallel Processing
3.	R. J. Cypser	:	Communication Architecture for distributed system
4.	James Martin	:	Design and Strategy for distributed data processing
5	R. Ramakrishnan	:	Database Management System

CSE-426 Cryptography and Network Security
Credits: 3, Hours/Week: 3

Overview, Terminology, Substitution and Transposition ciphers, One time pads, Symmetric Ciphers, classical Encryption Technique, Block Ciphers and the Data Encryption Standard, Introduction to Finite Fields, Advanced Encryption Standard, Contemporary, Symmetric Ciphers Confidentiality Using Symmetric Encryption Public, Key Encryption, One way functions and Hash Functions, Introduction to Number Theory, Prime number generation, Public-Key Cryptography and RSA, Key Management, Key exchange algorithm; Other Public-key Cryptosystems, Message Authentication and Hash Functions, Hash Algorithms, MD5, SHA, Digital Signatures and Authentication Protocols, DSA, Kerberos, Network Security Practice, Authentication Digital certificates and Public key infrastructure, X.500, Application Electronic Mail Security, IP Security, Web Security, System Security, Intruders, Malicious Software, Firewalls.

Recommended Books:

1.	Bruce Schneier	:	Applied Cryptography, John Wiley & Sons, Inc.
2.	Dieter Gollmann	:	Computer Security; ISBN: 0-471-97844-2; Edition: 1999; Publisher: John Wiley and Son Ltd.
3.	Edward Amoroso	:	Fundamentals of Computer Security Technology; ISBN: 0-13-108929-3; Publisher: Prentice Hall.
4.	W. Stallings	:	Cryptography and Network Security Principles and Practice, Prentice Hall, New Jersey, 1999.
5.	E. Biham and A. Shamir	:	Differential Crypt analysis of the data encryption standard, Springer Verlag, 1993.
6.	D. Denning	:	Cryptography and data security, Addison Wesley, 1982.
7.	N. Kobliz	:	A course on Number theory and Cryptography, Springer Verlag, 1994.

CSE-427 Cryptography and Network Security LAB
Credits: 1.5, Hours/Week: 3

Laboratory works based on CSE-426

CSE-428 Project or Thesis Work - II
Credits: 3, Hours/Week: 6

Continuation of Project or Thesis Work of CSE-419

Viva-voce
Credits: 0.5

At the end of semester final examinations, interview in front of the board of examiners based on the courses of the corresponding semester.